



FAA-C-2531
June 19, 1972

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

MICROWAVE REPEATER BUILDING

1. SCOPE

1.1 Scope.- This specification sets forth the technical requirements for design, fabrication, and integration of a transportable repeater building for microwave link facilities. This specification is to be used with the electronic equipment specification required by the contract schedule.

1.2 Objective.- The FAA recognizes the technical and economic advantages of the following procurement concepts and the contractor shall exercise them in his design.

- a. Quantity procurement of materials and equipment.
- b. Modular and prefabricated construction procedures.
- c. Design freedom for advantageous application of the latest manufacturing, assembling, and erecting techniques.
- d. Procurement of a manufacturer's stock product with a minimum of custom features and modifications.

The contractor's services shall satisfy these objectives and be in strict accordance with all requirements contained herein.

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2. APPLICABLE DOCUMENTS

2.1 FAA documents.- The following FAA standards, specifications, and drawings of the issues specified in the invitation for bids or request for proposals, form a part of this specification and are applicable in their entirety unless otherwise specified herein. This specification shall take precedence in the event of conflict.

2.1.1 FAA standards

| | |
|-------------|--|
| FAA-STD-002 | Federal Aviation Agency Standard for Engineering Drawings |
| FAA-STD-003 | Paint Systems for Structures |
| FAA-STD-005 | Preparation of Specification Documents |
| FAA-STD-013 | Quality Control Program Requirements |

2.1.2 FAA specifications

| | |
|-------------------|---|
| FAA-C-1217 | Electrical Work, Interior |
| FAA-D-2494/1 & /2 | Instruction Book Manuscripts Technical: Equipment and Systems Requirements |
| FAA-C-2256 | Temperature and Humidity Control Equipment |
| FAA-E-2446 | Television Microwave Link (TML) |

2.1.3 FAA drawings

| | |
|-----------|--|
| D-5413-21 | Radar Microwave Link Towers, Guyed - Self-Supporting Type RML, Obstruction Lighting Kits, Towers 20 Ft. Thru 150 Ft. |
| D-5413-22 | Radar Microwave Link Towers, Guyed Type RML, Obstruction Lighting Kits, Towers 160 Ft. Thru 400 Ft. |

(The FAA documents cited above may be obtained from the Contracting Officer in the Federal Aviation Administration office issuing the contract. Requests should fully identify the material desired and should cite the contract involved and use to be made of the requested material.)

2.2 Military and Federal specifications and standards.- The following Military and Federal publications, of the issues in effect on the date of the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein. This specification shall take precedence in the event of conflict.

2.2.1 Federal specifications

| | |
|----------|--|
| SS-T-312 | Tile, Floor; Asphalt, Rubber, Vinyl, Vinyl-Asbestos |
|----------|--|

2.2.2 Military specification

| | |
|--------------|------------------------------|
| MIL-F-16081E | Fans, Ventilating, Propeller |
|--------------|------------------------------|

2.2.3 Federal standard.- Department of Labor, Title 29, Chapter XVII, Part 1910, Occupational Safety and Health Standards.

(Information on obtaining copies of Military and Federal specifications and standards may be obtained from General Services Administration offices in Washington, D. C., Seattle, San Francisco, Denver, Kansas City, Mo., Chicago, Atlanta, New York, Boston, Dallas, and Los Angeles.)

2.3 Other publications.- The following publications, of the issue in effect on the date of the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein. This specification shall take precedence in the event of conflict.

2.3.1 Uniform Building Code, Volume I, current edition.- International Conference of Building Officials, 50 South Robles, Pasadena, Calif. 99101.

2.3.2 Heating, Ventilating, and Air Conditioning Guide and Data Book.- American Society of Heating, Refrigeration and Air Conditioning Engineers, 345 East Forty-seventh St., New York, N. Y. 10017.

2.3.3 National Electrical Code.- Publication No. 70, National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. 02110.

2.3.4 IES Handbook.- Illuminating Engineering Society, 1860 Broadway, New York, N. Y.

2.3.5 ASTM Standards.- American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103.

3. REQUIREMENTS

3.1 General.- The contractor shall layout, design, fabricate, and furnish transportable buildings suitable to house all the components, including electronic equipment, electrical/mechanical equipment, storage facilities, work surfaces, etc., required for a complete microwave repeater system. The electronic equipment, including optional electronic equipment specified in the contract schedule, shall be installed and tested in the building at the equipment contractor's plant. The building and installed electronic and electrical/

mechanical equipment shall be designed for transportation from the equipment contractor's plant to the installation site and future transportation to different locations by the Government. Periodic maintenance shall not be required on the building and installed electrical/mechanical equipment more often than at three month intervals.

3.1.1 Equipment to be furnished by the contractor.- Microwave repeater buildings shall be furnished by the contractor, complete, and in accordance with all specification requirements. Types to be furnished are specified in the contract schedule.

3.1.1.1 Type.- Requirements for the following types of buildings are covered herein.

| | |
|----------|-------------------|
| Type I | 6' x 8' building |
| Type II | 8' x 12' building |
| Type III | 8' x 16' building |
| Type IV | 8' x 24' building |

3.1.2 Documentation to be furnished by the contractor.- Documentation for the microwave repeater building shall be prepared and furnished by the contractor, complete, in accordance with all requirements, and shall include the items tabulated below. Submission times are specified in the contract schedule.

- (a) Standard layouts--for the repeater building, all equipment and plot layout.
- (b) Fabrication drawings and specifications--including the transportable building and all of its electrical and mechanical systems.
- (c) Construction drawings and specifications--including foundations; grounding and underground connections; and interface with the antenna support tower.
- (d) Calculations--including all design calculations, design assumptions, and parameters.
- (e) Building systems instruction book--including the description, transportation, installation, operation, and maintenance of the building system and all installed mechanical and electrical systems.

3.1.3 Interfaces.- The building furnished by the specification is intended for use with microwave equipment furnished by the contractor or the Government and various plant and electrical equipment to be furnished and installed by others in the future. The contractor shall design and provide all conduit, power wiring, electrical power

distribution panels, junction boxes, and supporting hardware required in the building to provide a complete operable interface between (a) electronic equipment and the antenna system, (b) building electrical system and the antenna heaters, (c) building electrical system and incoming underground power service, and (d) building electrical system and the tower obstruction lighting system. The contractor shall assure compatibility of the interface between components under his own design control and shall coordinate, through the Contracting Officer, to assure compatibility with components furnished by others to the extent specified in the contract schedule.

3.1.4 Standard layouts.- The layouts of equipment in the buildings shown in Attachment 1 are typical arrangements. The sketches are included herein to illustrate the general scope and relationships on an overall layout and serve as a base for the development and evaluation of the contractor's final layout. The contractor is encouraged to propose changes and improvements to the layout commensurate with final equipment configurations and state-of-the-art technology. The following minimum space and basic clearance requirements shall be included in addition to basic electronic equipment.

- a. A 36" clear work area shall be provided in front of all present and future electronic equipment and work benches. A 36" clear work area shall be provided at the rear of RML 1A, 2, 3, and 4 equipment.
- b. Space shall be provided near the building door for placement of a wall mounted 15 lb. CO₂ fire extinguisher and a 2 1/2 gallon soda-acid fire extinguisher by the Government.
- c. Type II, III, and IV building
 1. TML Equipment Rack (Future) - Type II building only.
 2. Uninterruptible Power System (Future)
 - Inverter Cabinet - 24"w x 16"d x 60"h - 500 lb.
 - Charger Cabinet - 24"w x 16"d x 60"h - 500 lb.
 - Battery Cabinet - 48"w x 22"d x 60"h - 900 lb.

3.1.5 Service conditions.- The building shall sustain the maximum stresses imposed by the following ambient service conditions without permanent deformation, damage, or degradation of operation.

| | |
|-----------------------|--|
| Temperature | -60°F to +130°F |
| Relative Humidity | 5% to 100% including condensation due to temperature changes |
| Minimum Wind Pressure | 50 pounds per square foot at 30' above ground |
| Roof Snow Load | 40 p.s.f. |
| Seismic | Zone 3 of Uniform Building Code |

Environment

Hail stones - 1/2" diameter
Salt spray
Urban industrial fumes
Fungus - as encountered in warm, humid atmosphere
Wind borne sand and dust - as encountered in deserts and plains of Western U. S.
Rain

3.2 Architectural

3.2.1 Appearance.- The exterior of the building should have a modern commercial or light industrial appearance. The appearance should reflect the precision and reliability of FAA activities and the utilitarian quality of public financed construction. The exterior colors shall blend harmoniously with the general site layout. Interior wall and ceiling colors shall give the appearance of largeness and openness. Color and texture effect on heat transmission and reflectance shall be considered for exterior and interior selections, respectively. All painting shall be in accordance with FAA-STD-003. Samples of all colors, interior and exterior, including trims, shall be submitted to the Contracting Officer for approval.

3.2.2 Shape and size.- The building shall be rectangular in shape. The nominal exterior dimensions of the Type I building shall be 6'-0" x 8'-0"; the Type II building shall be 8'-0" x 12'-0"; the Type III building shall be 8'-0" x 16'-0", and the Type IV building shall be 8'-0" x 24'-0". The maximum clear width of the buildings shall not exceed 8'-0", including minor protuberances such as door knobs, to facilitate over-the-road transportation. The wall thickness shall not exceed 5". The building and nonremovable roof mounted appurtenances, when loaded for over-the-road transport, shall pass through a highway underpass having clearance of 13'-6" with a minimum clearance of 3". The minimum interior floor-to-ceiling height shall be 8'-0" for Type I and II buildings and 9'-0" for Type III and IV buildings. The minimum interior head clearance (personnel safety) shall be 6'-9" in work areas.

3.2.3 Design criteria.- The building shall be designed in accordance with the Uniform Building Code, Volume 1. The building shall be designed for a 20 year useful life withstanding the environment and service specified herein. The building shall be designed to withstand subsequent relocations, with all equipment in place, after initial installation. The building shall be in accordance with all applicable requirements of Department of Labor standard, Title 29, Chapter XVII, Part 1910.

3.2.4 Materials and material applications.- Materials of construction shall be suitable for the intended application considering the building life, service conditions, and transportation loads. The ultimate sites for these buildings may range from coastal environments with salt

atmosphere to mountainous areas. Provision shall be made for prevention of corrosion; avoidance of unprotected faying surfaces, moisture traps, and galvanic couples due to contact between dissimilar metals; and proper selection and application of protective finishes. All painting shall be in accordance with FAA-STD-003.

3.2.5 Fire resistance.- Materials used for building construction (hidden and exposed) shall be noncombustible or fire retardant. Noncombustible materials shall be determined in accordance with ASTM B 136 (Test for Determining Non-combustibility of Elementary Materials). Materials which are inherently fire retardant or have received a fire retardant treatment shall produce a flame spread rating of not more than 25 when tested in accordance with ASTM E 84 (Surface Burning Characteristics of Building Materials). The fire retardant treatment shall not be subject to degradation due to weathering or custodial operations such as cleaning, washing, etc. Plastic materials (including foam insulation and sandwich panel rigid foam) shall be processed to impart self-extinguishing characteristics to the material when tested in accordance with ASTM D 635 and ASTM D 1692 (Flammability of Rigid Plastics Over 0.127 CM in Thickness and Flammability of Plastic Foams and Sheeting, respectively)."

3.2.6 Heat transmission.- The maximum heat transmission coefficient value throughout the roof, walls, floor, and door shall be 0.15 Btu/hr./sq. ft./°F. Calculations of the actual heat transmission coefficient shall be submitted for the approval of the Contracting Officer. The calculations shall be in accordance with the methods and values shown in the latest issue of the Heating, Ventilating, and Air Conditioning Guide and Data Book (ASHRAE Guide).

3.2.7 Lockset.- The exterior door shall be provided with a cylindrical, key-in-knob, lockset equal to Model 7K7E6AUS10 manufactured by Best Universal Lock Co., Inc., Indianapolis, Indiana. The lockset shall be adaptable to the existing FAA key locking system provided by Best Universal Lock Co. The lock shall be provided with a construction core which will be replaced by the Government with a regular FAA core.

3.2.8 Floor.- The floor shall be covered with 1/8" light green vinyl-asbestos tile conforming to Federal Specification SS-T-312. The tile color shall be approved by the Contracting Officer. The floor tile adhesive shall resist degradation from exposure to solvents and oil.

3.2.9 Roof.- There shall be no roof mounted equipment on Type I and II buildings. The Type III building roof shall be designed for mounting of two GFE antenna assemblies (maximum 10' nominal antenna diameter) and associated waveguide and wiring. The Type IV building roof shall be designed for mounting of four GFE antenna assemblies (maximum 10' nominal antenna diameter) and associated waveguide and

and wiring. All roofs shall sustain a 200 pound live load concentrated on one square foot placed at the center of the roof. The maximum allowable roof deflection, with all live loads applied, shall be $1/360$ of the span. The roof shall slope to drain a minimum of $1/8$ " per foot.

3.2.10 Openings.- All openings for conduit, waveguide, duct work, etc., shall be provided in the building as necessary for field installation of the system. Weatherproof covers shall be provided for each opening and provision shall be made to maintain the insulation rating of the building if the opening is not in use. A weatherproof closure shall be provided to seal around each conduit, waveguide, or cable that passes through an opening in the building. Hoods with insect screens and filter holders (filter intake air only) shall be provided for all air intake and exhaust openings. Hoods shall be detachable for transportation. Hoods shall be galvanized steel (minimum 22 gage) or other material with equal strength and corrosion resistance properties.

3.2.11 Doors.- The building shall have one exterior door. The door shall be a minimum of 3'-0" wide and a minimum of 7'-2" high. The door shall be structurally sound, insulated, and impervious to the weather. The door and door frame shall be metal. A minimum of three (3) hinges are required on each door. The door shall open out and be equipped with a brass or bronze threshold and weather stripping to prevent dust and moisture entry. The door shall be provided with an overhead surface type door holder equal to McMaster-Carr No. 1439A, standard duty, bronze.

3.2.12 Transportation.- The contractor shall design a method of transportation and handling for the building. The requirements of the specific techniques shall be provided on the building structure for the attachment or positioning of sling cables to facilitate lifting (loaded with electronic and mechanical equipment) to and from transport vehicles and onto the foundation. Lift points shall be permanently identified on the outside walls with $1/2$ " high letters of weld metal beads or letters recessed into a metal plate. Over-the-road transportation may be on either a flat-bed trailer, low-bed trailer, or other means which meet ICC regulations for interstate transport in all states in the continental United States. The floor structure of the building shall be designed for loading onto an 8'-0" wide trailer without special supports or pallets.

3.2.13 Data plate.- A nonferrous metal data plate, approximately 3 inches by 6 inches, shall be provided on the lower exterior surface at the lock side of the exterior door so as not to be hidden by steps or foundation work. The data plate shall contain the following information in the order listed:

BUILDING, MICROWAVE REPEATER, TRANSPORTABLE

Manufactured by (manufacturer's name) for

FEDERAL AVIATION ADMINISTRATION

Contract number: _____
 Serial number: _____
 Curb weight: _____ pounds
 Gross weight, maximum: _____ pounds
 Building Subcontractor: _____ (if applicable)

Maximum gross weight is defined as the maximum possible weight of the building and its contents as described in paragraph 3.1 and 3.1.4. Curb weight is defined as the building weight with only mechanical and electrical equipment installed. The manufacturer's name shall not be visible on the finished building except on the data plate.

3.2.14 Workbench and storage cabinet.- Type I buildings shall be provided with a laminated maple top, steel frame, workbench equal to McMaster-Carr No. 4756Y16 and a steel storage cabinet with one shelf and double doors wall mounted above the workbench. The cabinet shall be a minimum of 36" wide x 24" high x 12" deep. The bottom of the cabinet shall be mounted 24" above the top of the workbench.

Type II, III, and IV buildings shall be provided with a laminated maple top, steel frame, workbench equal to McMaster-Carr No. 4756Y23 and a steel storage cabinet with four adjustable shelves equal to McMaster-Carr No. 4587U11.

3.3 Structural

3.3.1 Design criteria.- Structural designs shall be in accordance with the Uniform Building Code, Volume 1. The building, including roof, shall be designed and connected to the floor structure so the structure as a whole shall be capable of resisting twice the overturning moment resulting from wind uplift forces stipulated with the floor structure anchored to the foundation. The structural design shall incorporate all requirements for openings and support made necessary by equipment installed in, on, or through the structure. Floor, wall, and roof surface materials shall not be used for support, restraint, or alignment of installed equipment. The floor system shall be designed to support a uniform live load, as determined by the contractor, based upon the maximum loads imposed by the equipment and personnel to be supported, recognizing that electronic equipment may be relocated within the building in the future. In no case shall the floor be designed for less than 40 psf. The floor system deflections due to live loads shall not exceed 1/360 of the spans. The ceiling shall be designed to support a uniform live load, as determined by the contractor, based upon the maximum loads imposed by equipment mounted or suspended from the ceiling. Design loads

shall be based on the service conditions of paragraph 3.1.5. The building shall be designed to withstand the dynamic loads resulting from sudden starting and stopping during transportation and movement over bumpy roads. The dead load of the building and all installed equipment shall be included in the dynamic design. The minimum vertical shock loading shall be 3 g and the minimum lateral and longitudinal shock loadings shall be 1 g. Shock loadings shall be considered to have a maximum frequency of 20 Hz.

3.3.2 Foundation design.- The building shall be designed for installation on a concrete slab, piers, or grade beams at a minimum of 6" above the finished site grade. The design shall include incoming underground power conduits and provision for grounding of building. An entrance landing shall be provided at the door. The contractor shall design and prepare standard foundation construction drawings and specifications suitable for Government contracts with small general contractors at field installation sites. An allowable soil bearing pressure of 4,000 pounds per square foot shall be assumed for the design, with a 48" maximum frost penetration.

3.4 Mechanical

3.4.1 Air conditioning.- The contractor shall select and furnish a window type air conditioner in each type of building. Equipment and installation shall be in accordance with FAA-C-2256. The system shall be sized to maintain the conditioned space at 80°F DB and less than 50% relative humidity with normal design conditions at 100°F DB and 76°F WB. The air conditioning load shall be calculated in accordance with the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Guide and Data Book and based on internal heat loads of electronic equipment in the normal mode of operation as well as any mechanical heat loads that might be within the conditioned space. Use building orientation which yields largest solar heat design conditions. Included in the air conditioning load shall be all lighting fixtures illuminated, one occupant, and transmission gains through roof, wall, and floor areas including solar load.

3.4.2 Air filters.- All outside air entering the building shall be filtered with throw-away type filters, not less than 1" thick. Filter face velocity shall not exceed 300 f.p.m.

3.4.3 Heating.- The contractor shall provide thermostat controlled electric heating to maintain an inside temperature of 75°F DB in each type of building. Credit shall not be taken for heat from electronic equipment. The heating system shall be designed for outside winter conditions of 0°F.

3.4.4 Ventilation.- The contractor shall provide thermostat controlled ventilation equipment in each type of building of sufficient capacity to limit the inside space temperature to not more than a 10°F rise above the outside ambient temperature. Propeller fans, if provided, shall conform to MIL-F-16081E, direct drive, wall mounting

type equipped with gravity shutters. Relief air dampers shall be motor operated. Intake and exhaust openings shall have weather hoods equipped with insect screens.

3.4.5 Controls.- Air conditioning, heating, and ventilation controls in each type of building shall be interlocked to prevent simultaneous operation. Air conditioners shall have adjustable start delay relays. The ventilation shall start operation when the inside space temperature exceeds 95°F. The ventilation system shall lock on to continuous operation until the air conditioner is repaired and manually returned to operation; and a ground output shall be provided for use by the RML in remoting the air conditioner failure condition. The ventilation thermostat shall have a minimum adjustment range from 90°F to 110°F. The thermostat(s) shall be located in a position not subject to drafts or extreme temperatures and not less than four feet above the finished floor. All controls, thermostats, and indicators shall have permanent markings to indicate system and function.

3.5 Electrical

3.5.1 General.- Electrical equipment shall be designed, sized, arranged, and furnished to accommodate all of the electrical power requirements of a complete microwave facility, including antenna system and optional or future equipment. The design shall be in accordance with the National Electrical Code and Specification FAA-C-1217. In the event of conflict, Specification FAA-C-1217 shall be followed.

3.5.2 Distribution system.- The Government will provide 120/240V, 60 Hz, single phase, three wire, overhead or underground commercial power service to the facility. The building electrical distribution system shall commence with the incoming service conduit and conductors as they enter the building floor or wall and extend throughout the microwave facility, including the antenna system and support tower. Spare electrical capacity of not less than 20% of the design load shall be provided in the distribution panelboard capacity and distribution wiring. Short circuits and overloads shall be cleared at the lowest possible level in the system via proper coordination of circuit breakers or fuses or both.

3.5.2.1 Panelboard and circuit breakers.- A 120/240 volt distribution panelboard with main breaker shall be provided to furnish power via individual circuits to electronic equipment, antenna heaters, electrical/mechanical equipment, lighting, tower obstruction lights (paragraph 3.5.6), and miscellaneous equipment. One 15 amp single pole and one 20 amp two pole spare circuit breakers shall be provided. Surge protectors shall be connected to the incoming service on the line side of the main distribution panelboard to limit surge voltages and prevent harmful transients that could damage electrical and electronic equipment from entering the system.

3.5.2.2 Wiring.- Wiring shall be provided in accordance with the National Electrical Code and FAA-C-1217. All wiring shall be run in duct or conduit. Wiring diagrams and graphic symbols shall be in accordance with FAA-STD-002. All power wiring shall be color coded in accordance with the National Electrical Code from its origin at a panelboard circuit breaker to its termination inside electronic equipment cabinets, mechanical/electrical equipment, or outlets.

3.5.2.3 Outlets.- A 120V single phase duplex outlet shall be provided above each workbench. A 240V grounded type, single outlet receptacle shall be installed 2'-0" above the floor on the opposite wall from the primary heating unit. The outlet will be for future addition of a supplementary heater by the FAA. The outlet circuit shall be served by a 20 amp breaker in the power distribution panel and the outlet shall be labeled "240 V Heater" in 1/2" high black letters on the wall below outlet.

3.5.3 Lighting.- Lighting levels and equipment shall be designed in accordance with the tasks to be performed, the Illuminating Engineering Society Handbook, and National Electrical Code criteria and requirements. The minimum level of interior illumination shall be 75 footcandles at a horizontal work plane 30" above the floor. Exterior illumination, minimum 60 watt incandescent lamp in weather-proof fixture, shall be provided at the door for personnel safety. The light fixtures shall be controlled by the interior wall mounted switches located on the latch side of the entrance door. Interior lighting fixtures shall be fluorescent type. Portable type Appleton Reelites, Catalog No. RE-7S26 Grounded, or equal, shall be furnished as required to provide work light in and around all electronic and mechanical equipment.

3.5.4 Grounding protection.- The building shall provide two separate and distinct grounding subsystems for electronic equipment cabinets and the electrical power system. Metal building structural members and siding shall be electrically continuous and grounded in accordance with the National Electrical Code. Each separate grounding subsystem shall be connected together at a common point for attachment to the site earth ground. The site earth ground system shall interconnect all building, tower, and power system grounds including lightning grounds.

3.5.5 Ductwork, conduit, waveguide, and cable.- Ducts and conduits shall be sized, arranged, and located to accommodate power conductors, and all coaxial and control cable required to provide a complete and usable system including optional and future equipment. Waveguide and electronic ductwork shall be located for optimum interconnection capability between equipment cabinets. All necessary support hangers for the waveguide shall be included. Ductwork shall be wall or ceiling mounted for maximum accessibility. The duct system shall facilitate expansion to install future equipment.

3.5.6 Tower obstruction lights.- Circuit breakers, duct, conduit, mounting space, and wall openings shall be provided in the building for the installation of the tower obstruction light system. The lighting control unit, photoelectric cell, and all wiring shall be furnished and installed by the contractor or others as specified in the Contract Schedule. The light system shall be in accordance with Drawings D-5413-21 and 22 for tower heights specified in the Contract Schedule.

3.6 Documentation requirements

3.6.1 Drawings.- All drawings shall be made on clear-print paper No. 1000 H or equal with the FAA title block in the lower right hand corner. Provide 1/2" border lines on the top, bottom, and right hand side. Provide a 1 1/2" border on the left side. The drawings shall be made on "D" size sheets (22" x 34"). Sample title and index sheets will be furnished. Drawings will be prepared in accordance with FAA Standard, FAA-STD-002. These drawings will be reduced to 10 1/2" x 16" by the FAA in the future. For this reason, the contractor shall take effort to assure that all drawings are clear and legible. The details and printing shall be of the size required for microfilming on 35mm film. The minimum letter height for a 22" x 34" sheet will be 5/32" and .05" spacing between letters. All letters shall be vertical capital letters.

3.6.2 Specifications.- Specifications for the designs shall be prepared in accordance with FAA-STD-005. The drawings and specifications developed shall be complete to the degree that they can be subsequently used by the Government without modification as technical documents for inclusion in a Government contract for fabrication and construction. The specifications shall contain complete provisions for factory and on-site testing and acceptance.

3.6.3 Building Systems Instruction Book.- The book covers the description, transportation, installation, operation, and maintenance of the building system and installed electrical and mechanical systems. Transportation shall include the packing, loading, moving, and reassembly of all systems and the packing and bracing of installed electronic equipment. Installation shall include a sequential coverage of the placement, assembly, and installation of all systems with adjustments, tolerances, and start-up procedures. The book shall provide a total systems overview, including functions, theory of operation, and interface of all systems. The book shall provide complete information on the interface of all systems with the antenna tower and incoming electric service. The book shall contain written descriptions, illustrations, catalog cuts, technical information, and pertinent data that has been detailed in the specifications or on the drawings. The book shall be prepared in accordance with Specification FAA-D-2494/1 and 2.

3.6.4 Documentation submissions and approvals.- Documentation items (a), (b), (c), (d), and (e) of paragraph 3.1.2 shall be submitted to the Contracting Officer for review and approval. Item (a) shall be approved by the Contracting Officer prior to the submission of items (b), (c), and (d). No fabrication work shall be started until all documentation has been approved by the Contracting Officer. The building systems instruction book shall be submitted in accordance with Specification FAA-D-2494/1. Documentation approvals shall in no way relieve the contractor from meeting the requirements of the specification.

3.6.4.1 Standard layout.- Five copies of the standard layouts (3.1.2(a)) of the building, equipment, and facility plot shall be submitted. The interior layouts shall include all present and future electronic and electro/mechanical equipment, power distribution panels, junction boxes, waveguide, and ductwork. Interior elevations shall be included, as necessary, to show wall mounted items and openings. The plot layout shall include foundations; all underground and overhead conduit, waveguide, and cables; relationship of building and antenna tower; and space requirements for construction, erection, and installation of the building. All dimensions necessary for the evaluation of the layouts shall be included.

3.6.4.2 Designs.- Five copies of the fabrication drawings and specifications (3.1.2(b)), construction drawings and specifications (3.1.2(c)), and calculations (3.1.2(d)) shall be submitted. Related calculations shall be submitted concurrently with each item of documentation to support all design requirements contained in this specification.

3.6.5 Documentation delivery.- The original copies of the construction drawings and specifications (3.1.2(c)), reproducible copies of the standard layouts (3.1.2(a)) and building fabrication drawings and specifications (3.1.2(b)), and final copies of related calculations shall be delivered to the Contracting Officer within fourteen (14) days after Government approval of each item. The original copies of the standard layouts and building fabrication drawings and specifications, with all modifications, corrections, and as-built changes shown, shall be delivered to the Contracting Officer within thirty (30) days after Government acceptance of the first completed building with electronic equipment installed. The delivery of the building systems instruction book shall be in accordance with Specification FAA-D-2494/1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Quality control provisions.- The contractor shall provide and maintain a quality control program in accordance with FAA-STD-013. All tests and inspection made by the contractor shall be subject to Government inspection.

4.2 Documentation.- The contractor or his authorized representative shall sign the original tracings of all drawings and the first page of all specifications, design calculations, or similar documents under the contractor's printed name and over the affixed replica of his professional seal or his registration certification number including the state or jurisdiction of issue.

4.3 Warranty.- The contractor shall provide a five year warranty covering materials, workmanship, and weatherproofing of the building and transfer this warranty to the Government at the time of final acceptance. All documents pertaining to warranties/guarantees of commercial items (heaters, circuit breakers, air conditioners, etc.) installed in the building shall be transferred to the Government at the time of final acceptance.

4.4 Visual and mechanical inspection.- The building shall be inspected for conformance to the fabrication drawings and specifications and the requirements of this specification. The inspection shall include, but not be limited to, workmanship, dimensions (including flatness and squareness), connections, missing parts, damaged materials, inoperative parts, damaged finishes, and parts not easily operable.

4.5 Electrical work.- All electrical wiring and equipment shall be inspected and tested in accordance with FAA-C-1217.

4.6 Temperature and humidity control equipment.- Heating, ventilating and air conditioning equipment shall be inspected, tested, and warranted in accordance with FAA-C-2256.

5. PREPARATION FOR DELIVERY

5.1 Equipment.- The contractor shall be solely responsible for protecting, preserving, packing, and marking all equipment for delivery to field installation sites. The equipment shall arrive at the sites in full accordance with the requirements of this document and acceptable for installation by the contractor or others.

5.2 Documentation.- The contractor shall be responsible for packaging, marking, and shipping all documents required by this specification to 800 Independence Avenue, S. W., Washington, D. C. 20591.

6. NOTES

6.1 Typical layouts.- The sketches of Attachment I portray a typical building and equipment layout but are not a requirement of this specification. The sketches are furnished only as a matter of information to the contractor to assist him in visualizing a typical layout. The

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Government does not represent or guarantee that conformance thereto will insure that the resulting product will meet specification requirements. Any reliance which the contractor places on Attachment 1 is wholly at his own risk and shall not relieve him of his contractual obligation to comply with all of the requirements of this specification.

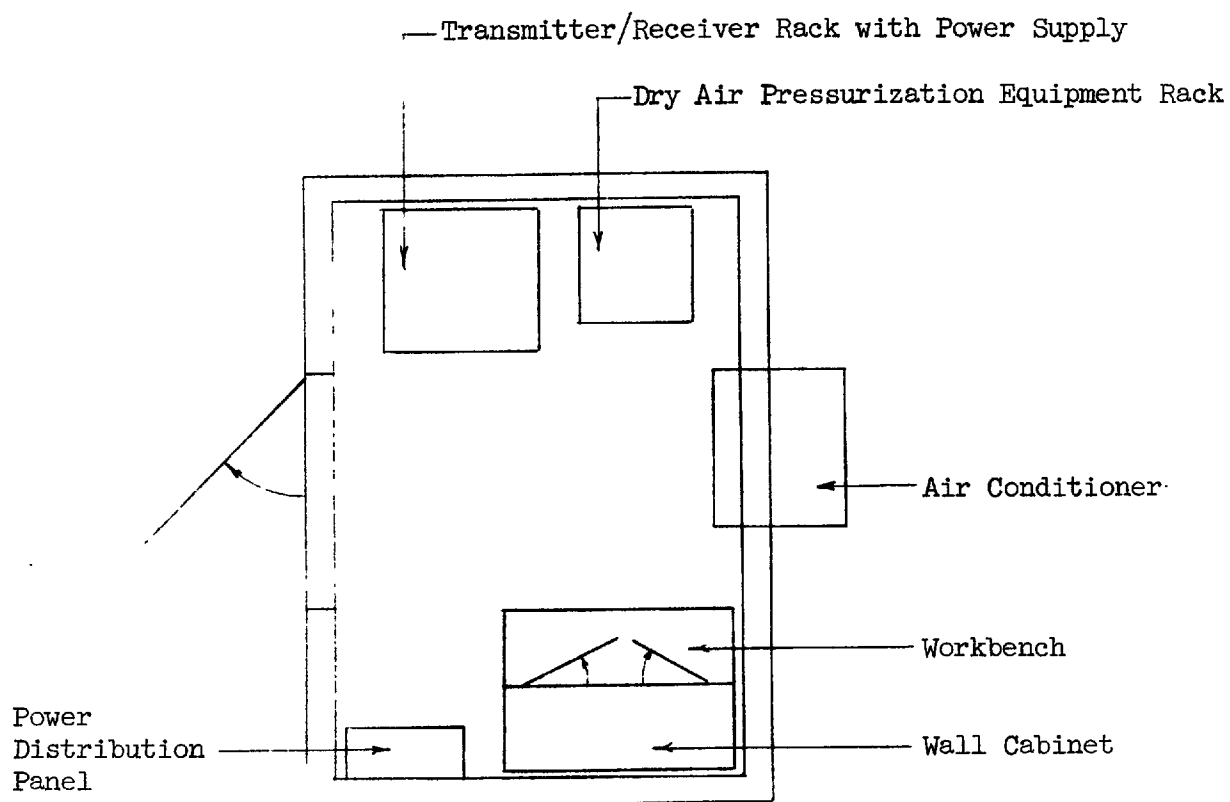
6.2 Intended use.- The Type I building is intended for use with electronic equipment procured from Specification FAA-E-2446. Addition of future electronic equipment to the Type I building is not planned.

The Type II building is intended for use with electronic equipment procured from Specification FAA-E-2446. Space is provided for the installation of Uninterruptible Power Supply equipment and for future installation of return path or redundant TML equipment.

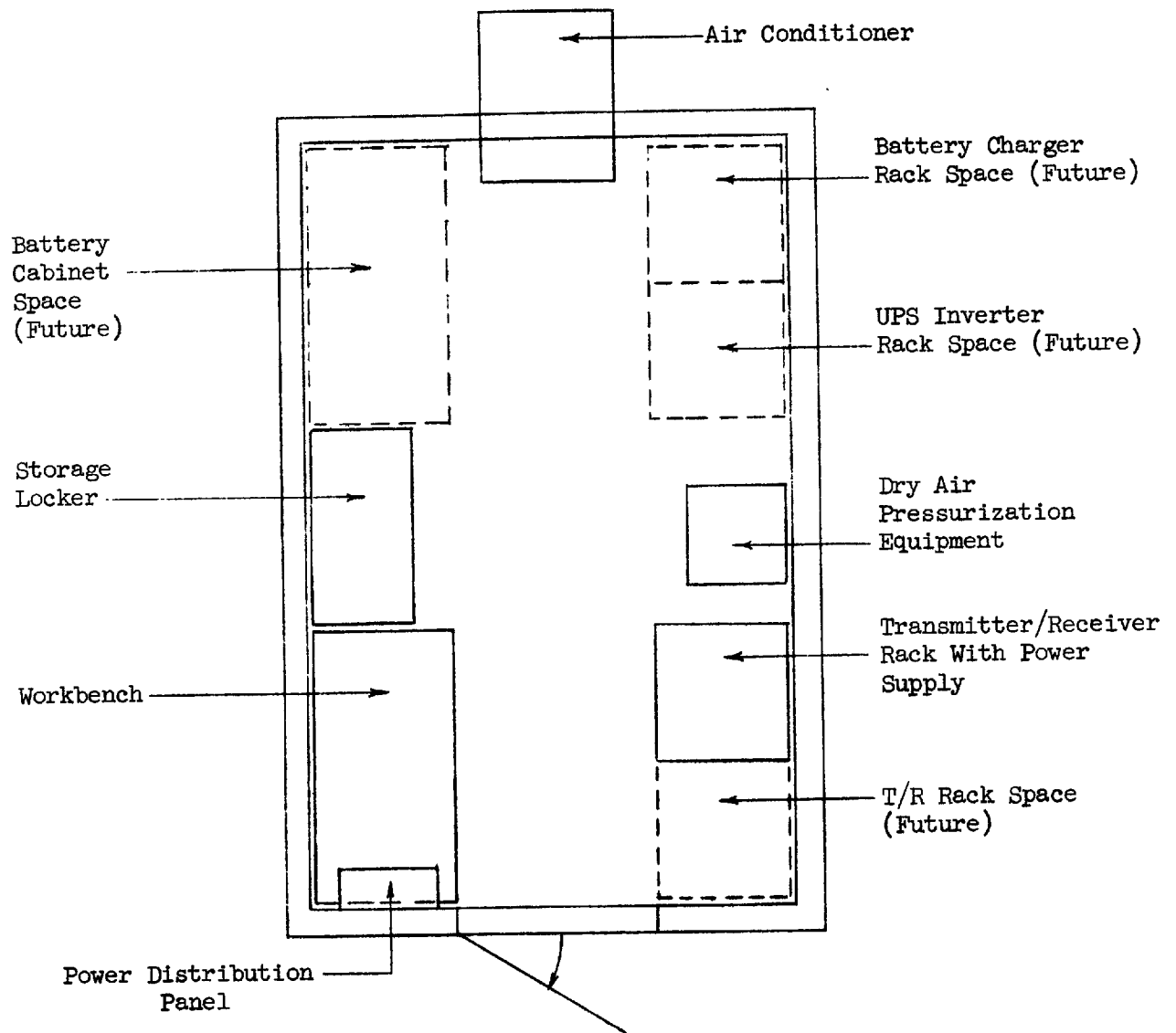
The Type III building is intended for use with existing tube-type RML-1A, 2, 3, and 4 equipment. Specific equipment information and specifications will be provided in the Contract Schedule. Space is provided for the installation of Uninterruptible Power Supply equipment.

The Type IV building is the same as a Type III building with additional space for a second set of repeater equipment. It is intended for use at dual path RML repeater facilities.

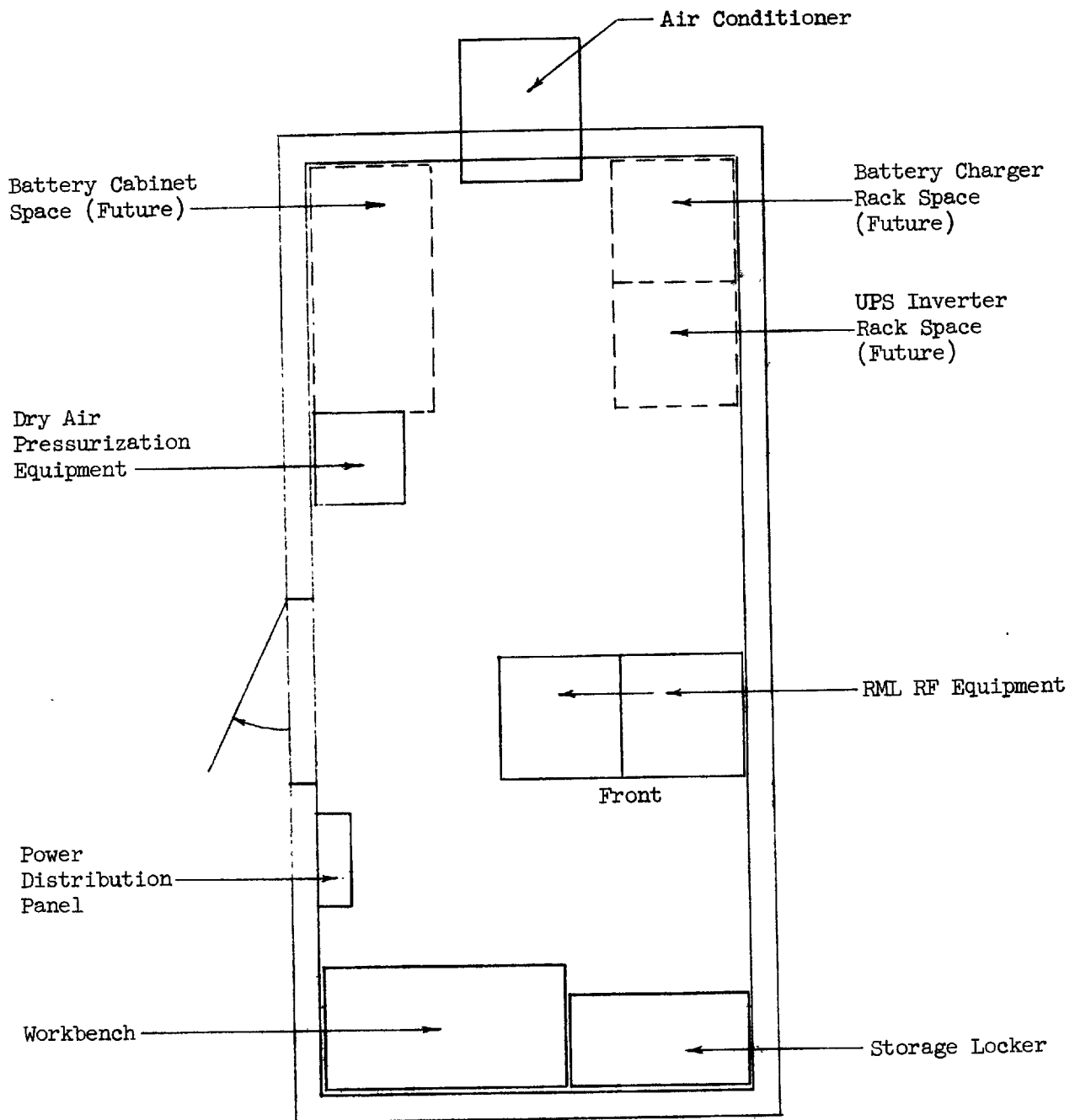
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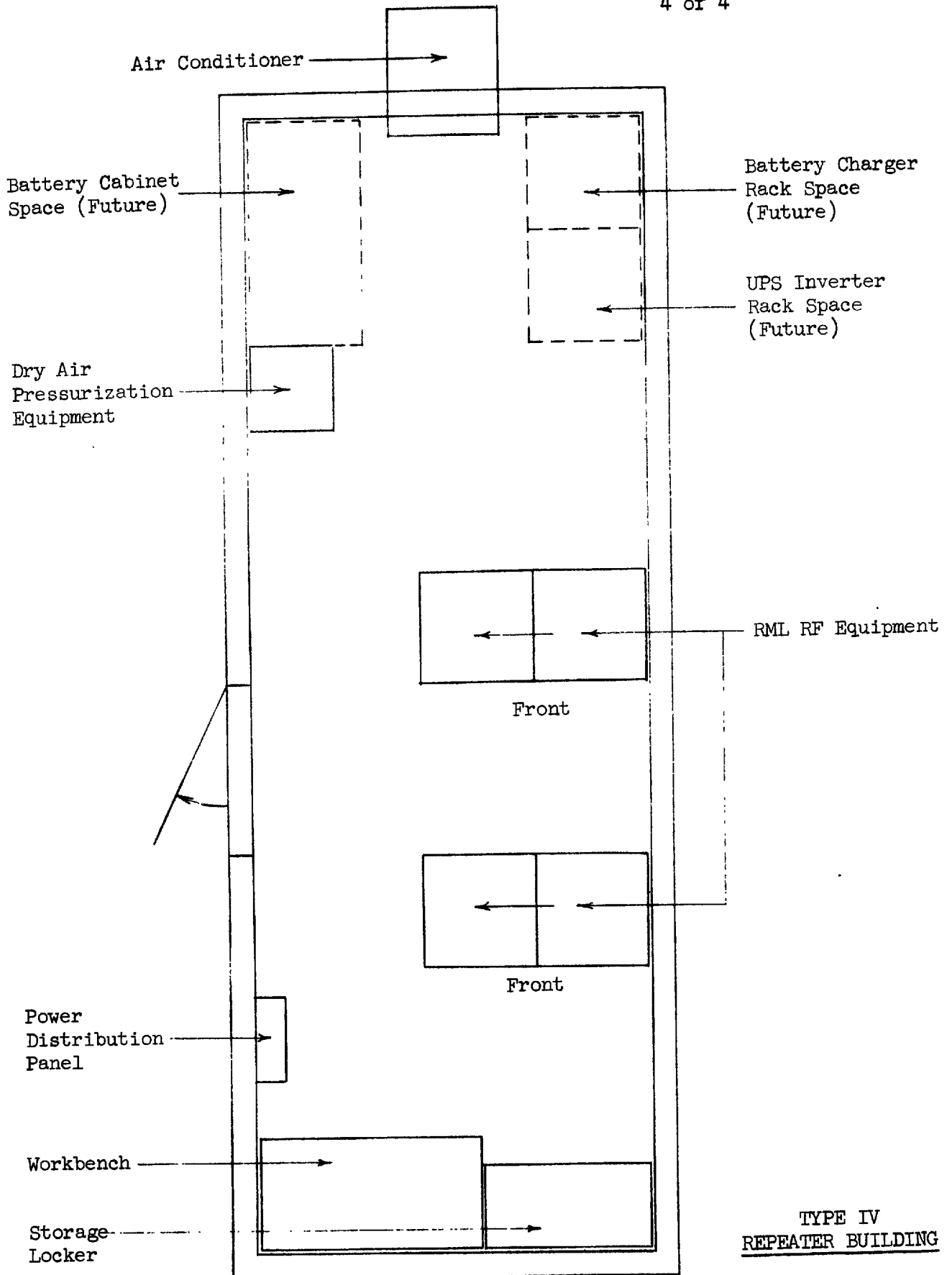
TYPE I REPEATER BUILDING



TYPE II REPEATER BUILDING



TYPE III REPEATER BUILDING



**TYPE IV
REPEATER BUILDING**